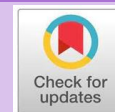


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Current Profile of Vivax Malaria in Isolated Area of Kualuh Leidong

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Abstract

The Indonesian Ministry of Health targets to eliminate malaria by 2030. Vivax malaria, a challenging variant to eradicate, is prevalent in areas near elimination, including North Sumatra, which ranks fourth in malaria cases in Indonesia. Labura district, a part of North Sumatra, had a low-endemic status until 2020. However, an increase in cases occurred in 2021 within the Kualuh Leidong sub-district, the primary contributor to Labura's malaria cases. This shifted the endemicity status from low to moderate. The objective of the study is to assess the malaria case profile in this region. A descriptive approach was used, employing a total sampling method at Tanjung Leidong Health Center between September 2022 and July 2023. This observational study identified 494 vivax malaria cases. Predominantly affecting males (60.9%), cases peaked in adults (>18 years) with 314 cases (63.6%). Microscopic examination was the leading diagnostic tool, used in 463 cases (93.7%). The health center primarily administered national regimen therapies dihydroartemisinin-piperazine (DHP) + primaquine in 204 cases (62.4%), whereas others received alternate therapies. All patients recovered without referrals. Over 11 months, seven recurrence cases emerged, with five receiving quinine+primaquine. Vivax malaria cases in Kualuh Leidong have seen a significant increase compared to previous years. The attention and collaboration of all parties, both from the health center and the community, are necessary to achieve malaria elimination by 2030.

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INTRODUCTION

Malaria elimination has made significant progress over the past two decades since the year 2000. The success of malaria management in the first two decades of the 21st century is even being called the golden era. Globally, the incidence of malaria cases (per 1000 at-risk population) has decreased from 80 cases in 2000 to 58 cases in 2015 and further decreased to 57 cases in 2019. Despite the significant reduction in malaria incidence cases from 2000 to 2015, malaria cases and mortality rates remained relatively stagnant in 2019, with 229 million cases and 409,000 deaths reported by the World Health Organization (WHO). In the Southeast Asia region, the reduction in malaria mortality and morbidity cases remains on target. Countries in Southeast Asia have shown a decrease in malaria cases and deaths of more than 40%, with the exception of Indonesia, which exhibited a reduction between 25% and 40% in 2020 compared to 2015.¹

In Indonesia, the malaria elimination program is targeted for the year 2030. Over the past decade, there has been a decrease from 465,764 cases (with an Annual Parasite Incidence, or API, of 1.96%) in 2010 to 222,085 cases (with an API of 0.86%) in 2018, which accounts for more than a 50% reduction. However, the reduction in malaria cases has stagnated since 2014, indicating that interventions in the elimination program still need further development to significantly reduce the number of cases.²

Although malaria has seen a global decrease in the past decade, malaria cases have been negatively impacted by the COVID-19 pandemic, reversing the progress made and returning global incidence and malaria death rates to 2015

levels. The total number of malaria cases increased to 241 million cases in 2020, up from 229 million cases in 2019. This is attributed to disruptions in malaria service delivery and management during the pandemic.³

The pandemic's impact on malaria cases has also been experienced in Indonesia. This is evident from the rise in malaria cases in 2021 and 2022. Malaria cases in 2020 initially stood at 254,055 cases, but they increased to 304,607 cases in 2021 and rose again to 443,530 cases in 2022.⁴

The eastern portion of Indonesia, more especially the provinces of Papua, West Papua, and East Nusa Tenggara (NTT), is the majority of the country's malaria-endemic areas. Only one province outside the eastern region of Indonesia still has districts with high endemicity, namely East Kalimantan Province, especially in Penajam Paser Utara District. In North Sumatra, 11 out of 33 districts have not yet achieved malaria elimination, with 8 of them having low endemicity and the remaining 3 having moderate endemicity. Labuhanbatu Utara District is one of the districts with moderate endemicity in North Sumatra.⁴

Tanjung Leidong Health Center is a primary health center located in Kualuh Leidong Sub-District, Labuhanbatu Utara District. Tanjung Leidong Health Center serves as the primary health center for the Kualuh Leidong Sub-District, which has high malaria cases in Labuhanbatu Utara District, including recurrence cases of vivax malaria. This study aims to provide an overview of malaria cases in the work area of Tanjung Leidong Health Center.

MATERIALS AND METHODS

Materials

Data was collected retrospectively using the medical record of the Health Center from September 2022 to July 2023 and the Indonesian national malaria surveillance system from 2015 to 2021.

Methods

A descriptive analytic observational study was undertaken in the operational domain of Tanjung Leidong Health Center, the principal healthcare facility in Kualuh Leidong Sub-District. The study spanned 11 months, commencing from September 2022 to July 2023. Passive surveillance was conducted over the 11-month period for malaria patients diagnosed using microscopic examination or rapid diagnostic test (RDT) at the healthcare facility. Patients availing treatment at the center were derived from all seven villages within the Kualuh Leidong Sub-District. Employing a total sampling methodology, the data compilation encompassed variables such as gender, age, occupation, village of residence, diagnostic assessments, and malaria treatment modalities.

To provide broader context, data on malaria cases from 2015 to 2021 were obtained from the Indonesian national malaria surveillance system, covering the entire Labuhanbatu Utara District. While these data sets originate from different geographic areas and time frames, they offer a general perspective on malaria trends. Notably, Kualuh Leidong Sub-District has historically been the highest malaria cases in the district, highlighting its relevance in regional malaria epidemiology. Data was then analyzed using SPSS version 27, with the results subsequently elucidated through mean values and percentages.

Study Area

The current study offers valuable insights into the current profile of vivax malaria in the isolated area of Kualuh Leidong, emphasizing the unique challenges and characteristics of malaria cases in this specific region. The geographical isolation of Kualuh Leidong presents a noteworthy observation in this study, as the majority of vivax malaria cases were found to originate from within the area itself.

Kualuh Leidong is one of the sub-districts in Labuhanbatu Utara District (Figure 1), which is located in the North Sumatra Province. The area of Kualuh Leidong District is 340.32 km², and is further divided into 7 villages. It has a tropical climate, which has dry season and rainy season. The population in the district reached 34,677 people. The village with the largest population is Tanjung Leidong Village, where 9,605 people live. The Tanjung Leidong Village is also the main village of the Kualuh Leidong, as the main Health Center and many government offices are located in this village.⁵



Figure 1. The location of Kualuh Leidong, one of the sub-districts in Labuhanbatu Utara District

Kualuh Leidong Sub-District is located around 50 km from the nearest

Hospital, taking 1.5 to 2 hours of travel via land route due to the bumpy and muddy road conditions (Figure 2). The access to and from this area will be limited when it is rainy season, as the roads can become very muddy and difficult to pass. This area is located in a coastal region with a poor level of environmental cleanliness, creating numerous water puddles. The majority of the community live in wooden houses built over the water. These conditions create an optimal environment for mosquitoes to breed and spread disease.



Figure 2. Kualuh Leidong road access and environment

RESULTS AND DISCUSSION

Patient’s Characteristics

Based on the data collected over the 11-month period from September 2022 to July 2023 (Table 1), there were a total of 494 malaria cases. The characteristics of malaria patients based on gender were predominantly male, with a total of 301 cases (60.9%), and adults aged 18-60 years were most affected, accounting for 63.6% of the total cases.

Based on Table 2, the data reveal a concentrated prevalence of vivax malaria in Tanjung Leidong and Pangkalan Lunang villages, both of which are in close proximity to Tanjung Leidong Health Center. This spatial association suggests that geographical factors may contribute to the higher incidence of malaria in these

areas. The challenging terrain and difficult access to healthcare facilities may impact the timely diagnosis and treatment of malaria cases, emphasizing the need for targeted interventions in these high-prevalence villages. The presence of geographical challenges in an area influences the community's treatment-seeking behavior. Individuals residing farther from health facilities are more inclined to seek traditional medicine treatment without undergoing proper diagnosis.⁶

Table 1. Basic characteristics of patients from passive surveillance since September 2022 to July 2023

Patient Characteristics	Cases	Percentage
Gender		
Male	301	60.9%
Female	193	39.1%
Age Group		
Children (0-18 years)	173	35.0%
Adult (>18 years)	314	63.6%
Data missing	7	1.4%

Table 2. Origin village of patients from passive surveillance since September 2022 to July 2023

Village	Cases	Percentage
Air Hitam	17	3.4%
Kelapa Sebatang	16	3.2%
Pangkalan Lunang	131	26.5%
Simandulang	20	4.0%
Tanjung Leidong	228	46.2%
Teluk Pulai Dalam	42	8.5%
Teluk Pulai Luar	23	4.7%
Outside of Kualuh Leidong	12	2.4%
No data	5	1%

The gender tendency to experience vivax malaria varies in each region, influenced by various factors such as economic status, culture, occupation, and others. Notably, in the context of this study, there is an observed male predilection for experiencing vivax malaria. This observation aligns with the outcomes reported by Tafesse et al., where males were more impacted by malaria

parasites than females over the last 10 years.⁷ However, this finding diverges from other studies that have identified a higher prevalence of vivax malaria in females compared to males.^{8,9}

The gender-specific distribution of vivax malaria appears to be contingent upon diverse contextual elements, emphasizing the intricate interplay of various contributing factors across different regions. The multifaceted factors influencing the gender-specific distribution of vivax malaria in Kualuh Leidong are also applicable to age groups. Vivax malaria poses a risk across all age groups.¹⁰ From this study, it is observed that the highest incidence of vivax malaria in Kualuh Leidong occurs in the adult age group. This contrasts with a study conducted in Ethiopia, which revealed that the age group of children under 5 years exhibited a higher prevalence of vivax malaria.¹¹ This difference might be because one of the main jobs in Kualuh Leidong is fishermen, which requires them to be at sea during nighttime hours. Additionally, the community members also tend to gather for social gatherings at the night, further increasing their risk of mosquito bites.

Malaria Diagnosis

Microscopic examination stands out as the most recommended diagnostic method for confirming malaria cases in Indonesia.¹² In the specific context of Kualuh Leidong, the microscopic examination diagnostic approach remains predominant, being employed in 93.7% of malaria cases (Table 3). The usage of RDT was in specific circumstances. RDT was used for patients living far from the health center and who can not easily access the health center, hence, the examination was conducted by local midwives. For cases where both diagnostic methods are used, these typically involve patients who visit the

health center's emergency unit outside of working hours. An initial RDT was performed as the microscopist was not present, and microscopic examination was done to confirm the diagnosis on the next day when the microscopist was available. This observation underscores that despite the geographic isolation of the area, the diagnostic tool utilized for malaria diagnosis is not impeded, provided that health facilities possess appropriate tools and personnel receive adequate training.

Table 3. Diagnostic methods used for malaria diagnostic from passive surveillance since September 2022 to July 2023

Methods	Cases	Percentage
Microscopic Examination	463	93.7%
Rapid Diagnostic Test (RDT)	25	5.1%
RDT & Microscopic Examination	6	1.2%

Malaria Treatment

Out of the 494 malaria cases in Kualuh Leidong Sub-District, Tanjung Leidong Health Center managed 327 cases (66.2%), while the remaining 167 cases (33.8%) were handled by private clinics (Table 4).

Table 4. Malaria treatment in Kualuh Leidong from passive surveillance since September 2022 to July 2023

Treatment	Cases	Percentage
Treated in Private Clinics	167	33.8%
Treated in Health Center	327	66.2%
DHP + Primaquine	: 204 cases (62.4%)*	
Quinine + Primaquine	: 90 cases (27.5%)**	
DHP	: 6 cases (1.8%)	
Quinine	: 4 cases (1.2%)	
Not coming back for treatment	: 23 cases (7%)	

* 2 cases of recurrent malaria

** 5 cases of recurrent malaria

The primary treatment at the health center was the first-line therapy of DHP + Primaquine. Quinine was used as an alternative when DHP was stock out. Detailed treatment data for cases handled by

private clinics were not available because only the microscopic slides of patients suspected of having malaria were sent to the health center for examination. Treatment at the private clinics likely involves quinine rather than DHP, as DHP is less accessible in private settings.

From the 327 patients who sought treatment at the health center, 7 patients (2.1%) experienced a recurrence of malaria within the 11-month observation period. Throughout the 11-month observation, none of the malaria patients experienced complications. Hence, all malaria management was conducted at the basic health facility level and did not require referral.

Although severe cases of malaria are not prevalent in Kualuh Leidong, the persistence of recurrent cases, albeit at a modest percentage (2.1%), poses a formidable challenge to the complete eradication of malaria. This recurrence rate aligns with findings from a study showing that the burden of *P. vivax* relapse varies widely across Indian regions, with reported proportions ranging from 1.47% to 6%.¹³ It is noteworthy that the nature of malaria recurrence can encompass relapse, recurrence, or reinfection, yet there currently exist no established modalities for distinguishing between these possibilities in Indonesia, especially in an isolated area such as Kualuh Leidong.¹⁴

Increase in Malaria Cases in the Last Few Years

The historical data on malaria cases in preceding years were extracted from the national malaria case reporting system in Indonesia. Figure 3 provides an overview of malaria cases in the Labuhanbatu Utara District annually. When examining the trend of malaria cases per year, the number of cases tends to decrease from 2015 to 2020. The declining case of malaria in the second decade of this century was also

observed in another country targeting the elimination of malaria.¹⁵⁻¹⁷ Since 2019, it has been observed that only *Plasmodium vivax* has been identified in Labuhanbatu Utara District, with no detection of any other type of Plasmodium. This situation mirrors the global trends in which attempts to lessen the burden of *Plasmodium vivax* have not produced a satisfactory outcome. *Plasmodium vivax* has been a challenge in malaria elimination due to the ability to be asymptomatic but still be transmissible and the ability to hide dormant in the liver stages, which can lead to relapse.¹⁸

In Figure 3, a noteworthy deviation occurred in 2021, where there was a surge in malaria cases, totaling 435 cases. This figure represents an increase of nearly twofold compared to 2020. Consequently, this upswing of cases in 2021 prompted a transition in the endemic status, shifting from a low-endemic area to a moderately endemic area. The interruptions brought on by the COVID-19 pandemic, which affected malaria control systems across the country, were expected to be the cause of the observed increase in malaria cases in 2021.

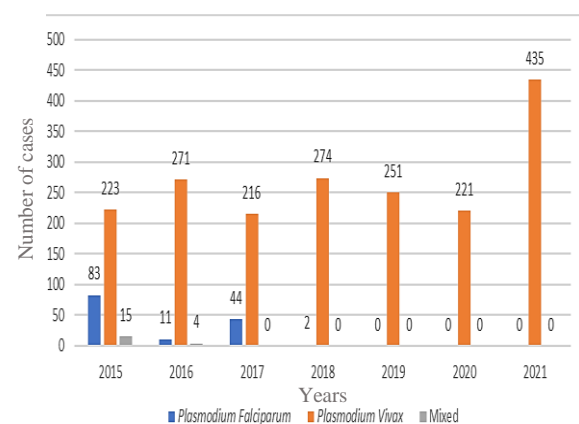


Figure 3. Number of malaria cases in Labuhanbatu Utara District from 2015 to 2021

The COVID-19 pandemic has had profound consequences on the national malaria program in Indonesia, contributing to a surge in malaria cases in 2021.⁴ The Kualuh Leidong area, in particular, has not

been exempt from this impact. As illustrated in Figure 3, malaria cases doubled in 2021. This escalation is not reported only in Indonesia but also in several other countries.¹⁹⁻²¹ The World Health Organization (WHO) reports that the incidence of malaria rose by 5% in 2020.²²

The pandemic of COVID-19 give a major disruption to health service delivery, including malaria management.²³ The global occurrence of hindered mobilization, isolation, and lockdown extended to China, the major provider of medical equipment, antibiotics, active pharmaceutical ingredients (API), and personal protective equipment (PPE) worldwide. The direct impact of the pandemic on malaria treatment manifested in disruptions to the drug supply chain. Consequently, this led to numerous stockouts of medications, including dihydroartemisinin + piperaquine (DHP).²⁴⁻²⁶ In our study area, these drug shortages had even more severe consequences due to the region's optimal environment for mosquito breeding, resulting in a high mosquito population. The use of quinine requires a longer duration and higher dosing frequency (7 days, thrice daily) compared to DHP (3 days, once daily), increasing the risk of transmission by prolonging the period during which Plasmodium remained in the blood stage.

STRENGTH AND LIMITATION

The strength of this study was its ability to gather data from an isolated location, thus giving information on the malaria situation in a remote location. However, the limitation of this study was the passive data collection and the collected data did not interfere with healthcare service flow, which leads to the restriction of collected information.

CONCLUSIONS

The data collected over an 11-month period from September 2022 to July 2023 highlights a significant increase in vivax malaria cases in Kualuh Leidong compared to previous years. The discernible increase is attributed not only to local factors but also to the broader impact of the COVID-19 pandemic, which has disrupted the national malaria control program, contributing to a surge in cases globally and specifically within Kualuh Leidong. Addressing these challenges and striving towards the ambitious goal of malaria elimination by 2030 necessitates collaborative efforts from all stakeholders, encompassing both health centers and the community.

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ETHICAL CLEARANCE

Ethics approval had been obtained from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Sumatera Utara, before the study was conducted (No. 1135/KEP/USU/2021).

FUNDING

The research received no external funding.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHOR CONTRIBUTION

We certify that each and every author has contributed to this work. Every author has contributed to the content's drafting and critical revision. Each author has approved this work and commits to take responsibility for it.

REFERENCES

1. World Health Organization. World malaria report 2020: 20 years of global progress and challenges. Geneva: World Health Organization; 2020.
2. Ministry of Health of The Republic of Indonesia. National Action Plan for Acceleration of Malaria Elimination 2020-2024. Jakarta; 2020.
3. World Health Organization. World health statistics 2022: monitoring health for the SDGs, sustainable development goals. Geneva: World Health Organization; 2022.
4. KEMENKES. Laporan Situasi Terkini Perkembangan Program Pengendalian Malaria di Indonesia Tahun 2022. Jakarta; 2022.
5. Badan Pusat Statistik. Kualuh Leidong Sub District in Figures. Labuhanbatu Utara: BPS-Statistics of Labuhanbatu Utara District; 2021.
6. Philothra BD, Alona I, Situmorang E, Limbardon P, Salsalina VG. Treatment-seeking behavior for malaria among communities in Indonesia: A systematic review. *Narra J.* 2023; Dec;3(3):e428.
7. Tafesse T, Desalegn R, Dereje A, Tolera C, Desalegn D, Amenu D. Trends of malaria cases (*Plasmodium* species) in Gute Health Center, Wayu Tuka District, East Wollega Zone, (2013-2022): A cross-sectional study. *Health Sci Rep.* 2024; May 23;7(5):e2156.
8. Quaresima V, Agbenyega T, Oppong B, Awunyo JADA, Adomah PA, Enty E, et al. Are Malaria Risk Factors Based on Gender? A Mixed-Methods Survey in an Urban Setting in Ghana. *Trop Med Infect Dis.* 2021; 6(3):161.
9. Okiring J, Epstein A, Namuganga JF, Kanya EV, Nabende I, Nassali M, et al. Gender difference in the incidence of malaria diagnosed at public health facilities in Uganda. *Malar J.* 2022; 21(1):22.
10. Dayananda KK, Achur RN, Gowda DC. Epidemiology, drug resistance, and pathophysiology of *Plasmodium vivax* malaria. *J Vector Borne Dis.* 2018; 55(1):1-8.
11. Abossie A, Getachew H, Demissew A, Habtamu K, Tsegaye A, Zhong D, et al. Profiling *vivax* malaria incidence, residual transmission, and risk factors using reactive case detection in low transmission settings of Ethiopia. *Malar J.* 2024; 23:362.
12. KEMENKES. Buku Saku Tatalaksana Kasus Malaria. Jakarta; 2020.
13. Koko LPK, Singh V. Burden and clinical characteristics of recurrent *Plasmodium vivax* infections, and impact of primaquine for radical cure: a systematic scoping review in India. *Front. Malar.* 2024;1-19.
14. KEMENKES. Keputusan Menteri Kesehatan Republik Indonesia Tentang Pedoman Nasional Pelayanan Kedokteran Tatalaksana Malaria. Jakarta; 2019.
15. Kessler A, Shylla B, Singh US, Lyngdoh R, MMawkhlieng B, Eijk AM, et al. Spatial and temporal village-level prevalence of

- Plasmodium infection and associated risk factors in two districts of Meghalaya, India. *Malar J.* 2021;20:70.
16. Kessler A, Eijk AM, Jamir L, Walton C, Carlton JM, Albert S. Malaria in Meghalaya: a systematic literature review and analysis of data from the National Vector-Borne Disease Control Programme. *Malar J.* 2018;17:411.
 17. Lindblade KA, Hong LX, Tiffany A, Galappaththy, Alonso P, et al. Supporting countries to achieve their malaria elimination goals: the WHO E-2020 initiative. *Malar J.* 2021;20:481.
 18. Angrisano F, Robinson LJ. Plasmodium vivax – How hidden reservoirs hinder global malaria elimination. *Parasitology International.* 2022; 87: 102526.
 19. Gavi S, Tapera O, Mberikunashe J, Kanyangarara. Malaria incidence and mortality in Zimbabwe during the COVID-19 pandemic: analysis of routine surveillance data. *Malar J.* 2021;20:233.
 20. White NJ, Day NP, Ashley EA, Smithuis FM, Nosten FH. Have we really failed to roll back malaria?. *The Lancet.* 2022;399:799-800.
 21. Noor AM, Alonso PL. The message on malaria is clear: progress has stalled. *Lancet.* 2022;399:1777.
 22. World Health Organization. World Malaria Report 2022. Geneva: World Health Organization; 2022.
 23. Penjor K, Tobgyal, Zangpo T, Clements ACA, Gray DJ, Wangdi K. Has COVID19 derailed Bhutan's national malaria elimination goal? A commentary. *Malar J.* 2021;20:20.
 24. Congressional Research Service. COVID-19: China Medical Supply Chains and Broader Trade Issues. Congressional Research Service; 2020.
 25. Economic Commission for Latin America and the Caribbean. United States supply chains resiliency: the key role Latin America and the Caribbean could play. Washington D.C.: Economic Commission for Latin America and the Caribbean; 2021.
 26. Miller HI, Cohnsen JJ. China's Coronavirus-Induced Paralysis Threatens U.S. Drug Supply Chain. *Mo Med.* 2020; 117(2):86-88.